ICS 104 Homework #1 (Due Saturday February 26, 2022 at midnight)

- Please note the following regarding homework submissions:
  - No email submissions will be accepted under any circumstances.
  - The deadline for all homework assignments will be at midnight.
  - The submission after the deadline will be opened for 6 hours (i.e. until 6:00am next morning) and submissions will be marked as Late. However, you will not lose any marks because of that.
  - After 6:00am, submission will be closed. Failure to submit before that time results in an automatic zero.
  - The hw is to be solved individually. Any similarity in hws will lead to 0 for all students involved.
  - Once you write all codes in their corresponding cells, go to File -> download as -> notebook (.ipynb). Then submit the downloaded notebook.
  - If you make a mistake, you can resubmit. The Blackboard will consider the last submission.
  - Once you submit, download your submitted file and check that the cells contain code and they are not empty.

Instructions:

- Solve Questions 1,2 and 3 in the respective cells below. **Make sure you fill in any place that says** `YOUR CODE HERE`.
- **Make sure that your program output matches the sample runs in all Questions.**
- **The grade distribution is as follows:**
  - Programming style (comments and variable names): 10 pints
  - Question 1:
    - Correct Code: 20 points.
  - Question 2:
    - Correct Code: 30 points.
  - Question 3:
    - Correct Code: 40 points.

Note:

- You should write comments to help other programmers understand your code.
- Do not use magic numbers and define the constants value as a constant variable.
- Name your variables based on Variable Naming Conventions rules.
- You can assume that the user will provide a valid input for all requests, unless mentioned otherwise.

Question 1 (20 points)

A vector is a quantity that has both a direction and a magnitude.

Given the magnitude **a** and the angle θ of a vector, the **x component** of the vector can be calculated as: **a** $\cos(\theta)$ Similarly, the **y component** can be calculated as: **a** $\sin(\theta)$

Write a python program that prompts for and reads the **magnitude and angle** [in degrees] of a vector, it then calculates and displays the **x component and y component** of the vector. The **x component** and the **y component** must be displayed with an appropriate message and in **two decimal places**.

Notice that the cos and sin functions in the math module accept angle in radians. So you need to convert angle from degrees to radians using the appropriate function from the math module.

Sample Program run:

```
Enter the magnitude of the vector: 6
Enter the angle of the vector in degrees: 60
The x compnent of the vector = 3.00
The y compnent of the vector = 5.20
```

In [1]:
```python
##
# This program calculates the x and y component of a vector given its magnitude and direction
#

magnitude = float(input("Enter the magnitude of the vector: "))
angle = float(input("Enter the angle of the vector in degrees: "))


from math import cos, sin, radians
angleInRad = radians(angle)

xComp = magnitude * cos(angleInRad)
yComp = magnitude * sin(angleInRad)


print("The x component of the vector = %.2f" % xComp)
print("The y component of the vector = %.2f" % yComp)


```

```
Enter the magnitude of the vector: 6
Enter the angle of the vector in degrees: 60
The x component of the vector = 3.00
The y component of the vector = 5.20
```

Question 2 (30 points)

A phone company charges its customers every month based on the amount of data consumed. The rates are detailed in the following table:

Data Usage (n), Gbs	Charges
$0.0 < n \le 1.0$	300
$1.0 < n \le 2.0$	550
$2.0 < n \le 5.0$	1200
$5.0 < n \le 10.0$	1650
$n > 10.0$	2500

Given the amount of data used by the customer (i.e. n), write a program to calculate the internet bill. If the user enter a negative number or zero, your program should show the appropriate message.

Sample Program runs:

Sample run #1

```
Enter the amount of data used in Gbs: -6
Invalid input: data usage cannot be negative.
```

Sample run #2

```
Enter the amount of data used in Gbs: 0
You consumed ZERO data, you have no charges in your internet bill.
```

Sample run #3

Enter the amount of data used in Gbs: 2.5
You will be charged 1200

```
1
2  n = float(input("Enter the amount of data used in Gbs: "))
3
4  if n > 10 :
5      charges = 2500
6      print("you will be charged", charges)
7  elif n > 5 :
8      charges = 1650
9      print("you will be charged", charges)
10 elif n > 2 :
11     charges = 1200
12     print("you will be charged", charges)
13 elif n >1 :
14     charges = 550
15     print("you will be charged", charges)
16 elif n > 0 :
17     charges = 300
18     print("you will be charged", charges)
19 elif n == 0 :
20     charges = "ZERO"
21     print("you consumed", charges, "data, you have no charges in your internet bill")
22 else :
23     print("Invalid input: data usage cannot be negative.")
24
25
```

In [2]:

```
Enter the amount of data used in Gbs: 0
you consumed ZERO data, you have no charges in your internet bill
```

Question 3 (40 points)

A phone company offers customers 400 minutes of calls on Weekdays for 39.99 Riyal, additional weekday minutes cost 0.30 each. All calls at night and weekend are free.

There is a tax of 15% on the final total of the phone bill.

Write a program that prompts the user to enter their name, the number of weekdays minutes, night minutes, and weekend minutes used. The program then calculates the phone bill and the average cost of one minute (before tax).

The program should then display the customer name, bill total before tax and the average minute cost. The program then display the tax amount, and the total bill including the tax. The program should display all numbers with appropriate message and with two decimal places. Display average cost per minute with 4 decimal places

Sample Program run:

Enter your name: Ali
Enter the number of weekdays minutes: 450
Enter the number of weekends minutes: 200
Enter the number of night minutes: 100
Mr. Ali, your bill amount after tax is 63.24 (Riyals)
Total before tax is 54.99 Riyals, with tax = 8.25 (Riyals)
Average minute cost before Tax = 0.0733 (Riyals)

In [3]:

```
1
2
3  TAX_ON_BILL = 0.15
4  OFFER_MINS = 400
5  OFFER_PRICE = 39.99
6  ADDITIONAL_MINS = 0.3
7
8  # User input for processing
9
10 name = input("Enter your name: ")
11 weekDaysMins = float(input("Enter the number of weekdays minutes: "))
12 weekEndsMins = float(input("Enter the number of weekends minutes: "))
13 nightMins = float(input("Enter the number of night minutes: "))
14
15
16
17 aboveOffer = (weekDaysMins - OFFER_MINS) * ADDITIONAL_MINS
18
19
20 if weekDaysMins > OFFER_MINS :
21     beforeTax = aboveOffer + OFFER_PRICE
22     bill = TAX_ON_BILL *beforeTax + beforeTax
23     tax = TAX_ON_BILL * beforeTax
24 else :
25     bill = OFFER_PRICE * TAX_ON_BILL + OFFER_PRICE
26     beforeTax = OFFER_PRICE
27     tax = TAX_ON_BILL * beforeTax
28
29 # Note: if the calls on weekdays are less than 400 minutes, the bill before and after tax are fixed (i.e. 39.99 and 45.99).
30
31 totalMins = weekDaysMins + weekEndsMins + nightMins
32 average = beforeTax/totalMins
33
34 #Lastly, the printed output for the user.
35
36 print("Mr."+ name +", your bill amount after tax is %.2f" % bill, "(Riyals)")
37 print("Total before tax is %.2f Riyals, with tax = %.2f (Riyals)" % (beforeTax, tax))
38 print("Average minute cost before Tax = %.4f (Riyals)" % average)
39
40
41
```

```
Enter your name: Ali
Enter the number of weekdays minutes: 450
Enter the number of weekends minutes: 200
Enter the number of night minutes: 100
Mr.Ali, your bill amount after tax is 63.24 (Riyals)
Total before tax is 54.99 Riyals, with tax = 8.25 (Riyals)
Average minute cost before Tax = 0.0733 (Riyals)
```

In [ ]: | 1

End of the Homework

Good luck...

In [ ]: | 1